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**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
| | ) | |
| Implementation of Sections of | ) | MM Docket 92-266 |
| the Cable Television Consumer | ) | |
| Protection and Competition Act of 1992 | ) | |

# Comments of the Fiber Optics Division, Telecommunications Industry Association

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**Summary**

The cable industry's increasing use of advanced technologies is illustrated by an annual growth rate of more than 100% for fiber deployment in 1992. This accounted for 11% of total fiber deployment in the nation, up from 7% in 1991. In less than four years, cable has gone from virtually no homes to more than 10 million homes passed today by fiber -- defining homes passed as those served by "fiber to the node" discussed in Part II within. Distinctive architectures have emerged allowing ready upgrade to provide interactive broadband switched network services, as contrasted with the industry's original offerings of one-way television entertainment.

While adopting the Cable Act of 1992 to correct perceived problems in the cable industry, Congress applauded the industry's growth in system capacity, reliability and original, other-than-broadcast services. Therefore the Commission's basic rate guidelines and its standards of reasonableness for expanded basic services should seek to encourage cable's continued improvements in hardware and software.

The cable industry is one of several industries which, in competition and collaboration, are acting to create an advanced telecommunications infrastructure made up of a "network of networks." Regulatory encouragement of these deployments, as President Clinton, has recognized, is a matter of national interest. Japan and Germany, among other nations, are acting on this belief, and U.S. businesses and consumers will benefit from the widely acknowledged productivity yields of an improved communications infrastructure.

The manner in which the Commission implements the 1992 Act can create incentives, or at least minimize disincentives, for continuing advanced

network deployment by the cable industry. Allowing operators to cost-justify rates designed to recover prudent expenses for new builds, rebuilds and upgrades is a proper incentive. So also is flexibility in cable programming service rates where an operator or franchising authority adheres to Congressional desires to keep basic rates low. Benchmarking of rates should provide for an Advanced Technology Cost-of-Service model, for which TIA believes data is becoming increasingly available.

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## Comments of the Fiber Optics Division, Telecommunications Industry Association

The Fiber Optics Division of the Telecommunications Industry Association (TIA) submits these comments in response to the Notice of Proposed Rulemaking ("Notice") in the above-captioned proceeding, FCC 92-544, released December 24, 1992.

### I. Introduction

The Telecommunications Industry Association is a membership organization representing over 500 manufacturers of equipment used by all participants in the communications industry. The more than 100 members of TIA's Fiber Optics Division make fiber optic systems and components. TIA companies also manufacture transmission equipment and earth stations used by the broadcasting, cable television, and satellite video distribution industries.

TIA has been an active participant in other rulemakings before the Commission that have the potential to affect the deployment of fiber optics throughout the communications industry.[1] Most recently, TIA submitted comments in the video-dialtone proceedings demonstrating the deployment and use of fiber in the telecommunications industry.

Through these comments, TIA seeks to demonstrate, in a similar manner, the importance of fiber in the cable television industry. Specifically, TIA wishes to ensure that reregulation of the cable industry does not impede the deployment of new cable technologies that promise to bring improved and enhanced services to the cable subscriber. Over the past several years, cable systems have begun to upgrade or rebuild their systems and have been deploying fiber optic technology increasingly closer to the subscriber. TIA urges the Commission to adopt regulations that will allow this process to continue and will not produce disincentives for this type of investment.

## II. The cable industry's role in fiber deployment

The cable television industry has become an increasingly more significant market segment for fiber optic deployment. Although cable television is currently a small player in terms of total fiber deployed, it is a leader in overall growth. For example, the annual growth rate of fiber deployment in the cable industry will be over 100% in 1992. This compares with a growth rate of approximately 30% for local exchange carriers and 14% for interexchange carriers.[2]

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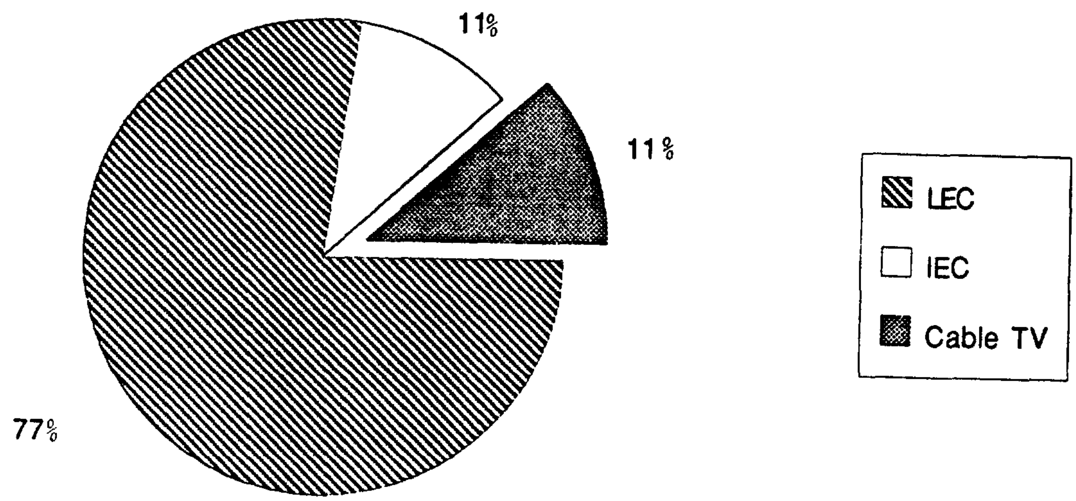
[1] Comments and Reply Comments, Telephone Company-Cable Television Cross-Ownership Rules, Sections 63.54-63.58, CC Docket 87-266 (February 3 and March 5, 1992); Comments, Reexamination of the Effective Competition Standard, MM Docket 90-4 (February 14, 1991); and Comments, Competition in Cable TV Service, MM Docket 89-600 (March 1, 1990).

[2] Source: Corning Incorporated.

*MSOs are setting the pace of fiber deployment.*

Fiber deployment among cable multiple system operators (MSOs) is widespread throughout the industry. As of March 1992, 48 of the top 50 MSOs had deployed fiber in their networks. *See* Cable TV Technology at pp. 4-5 (March 25, 1992).[3] These top 50 MSOs supply programming to 90% of the the cable television households in the U.S. In 1992, cable accounted for 11% of total fiber deployment, up from 7% in 1991. *See* Chart 1. This total will increase at current growth rates.

Chart 1. Volume by Application Segment 1992.




Source: Corning Incorporated

The continued deployment of fiber optics in the cable industry is foretold by MSO capital expenditures. Since 1988, cable expenditures on fiber have increased from $2.2 million to a 1992 total of $75 million.[4] The 1991 and 1992 spending levels were nearly double the spending in each of the previous years.

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[3] TIA will submit this newsletter containing detailed data on fiber deployment by the top 50 MSOs at a later date.

[4] Source: Paul Kagan Associates, Inc., February 1992.

Much of this increase can be attributed to the introduction and widespread deployment of AM optical systems beginning in 1988.[4]

Not only are MSOs deploying fiber in increasing volume; they are also deploying it closer to the home. While the number of optical nodes is increasing, the number of homes per node is on the decline, signaling greater fiber penetration toward the home. For example, in less than four years, cable has gone from passing virtually no homes with fiber to passing more than 10 million homes today.[5]

*Cable system architectures are evolving to take advantage of newly deployed fiber optic technology.*

Cable television system architectures are rapidly evolving towards multi-function, multi-service networks. Much of this evolution is due to the increased deployment of fiber. However, because fiber is gradually integrated into existing coaxial architectures, several different architectures representing fiber/coaxial hybrids are being deployed.

The traditional coaxial architecture is known as a tree-branch design. *See* Figure 1. A coaxial trunk runs from the headend and branches into a number of feeder lines that reach into neighborhoods and ultimately to the individual subscribers. Signal amplifiers are placed at intervals along the coax route to boost the signal as it moves down the system. The feeder portion of the plant represents approximately 85% of the total plant miles and plant investment.

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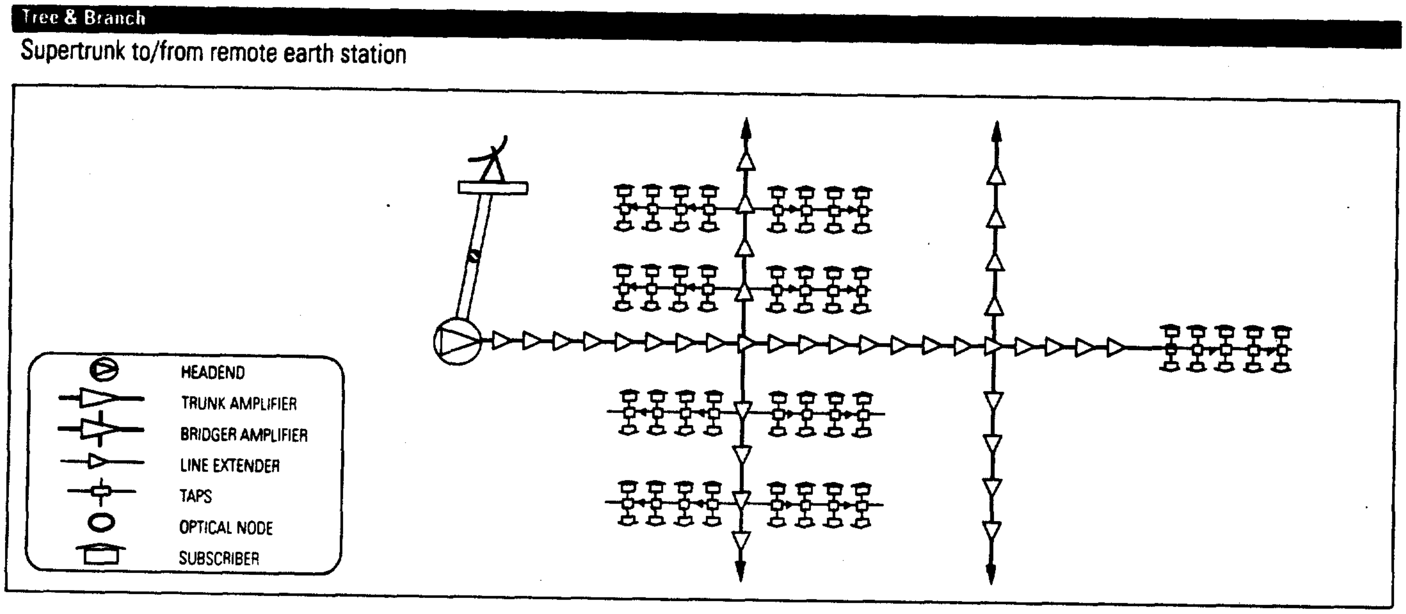
[4] Because vestigial sideband amplitude modulation (VSB/AM) is the modulation technique for North American television transmission systems transporting NTSC video signals, the use of AM fiber often is more economical than frequency modulation (FM) fiber,where modulators and demodulators would be required to translate from AM to FM and back again.

[5] Statistics compiled by Corning Incorporated. Homes passed is defined as homes served by fiber up to the node.

Figure 1. Tree & Branch Architecture.

**Tree & Branch**

Traditional cable TV architecture. Feeder and drop cables branch off coaxial trunk lines which travel back to the headend.

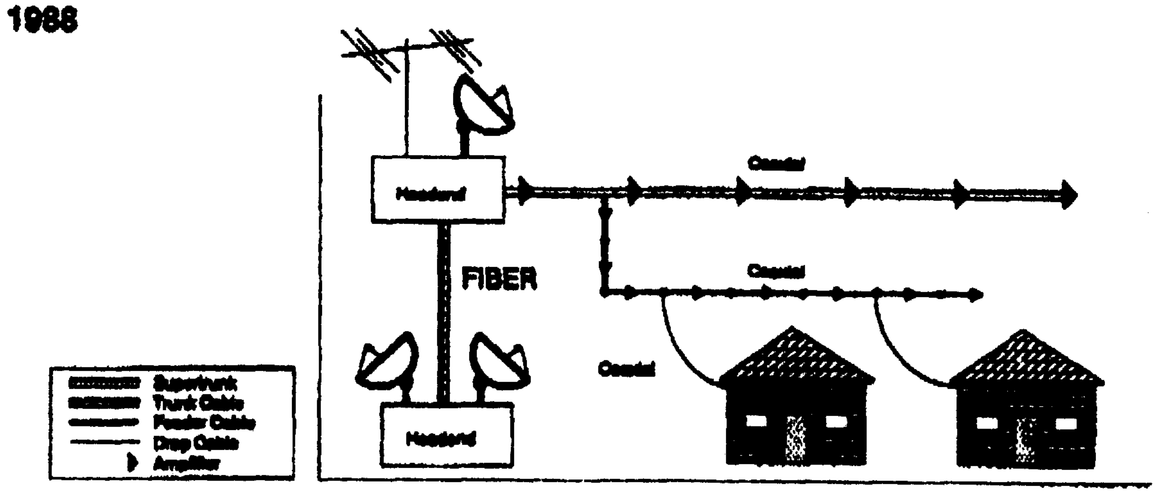



Fiber has been integrated into the tree-branch architecture through various designs and for different reasons. While most new builds may be constructed with fiber, the more typical use is upgrades and rebuilds. Upgrades involve the overlay of fiber optic cable to existing coaxial trunk lines. This reduces the number of trunk amplifiers between the headend and the feeder cables but retains the existing feeder coaxial plant.

For rebuilds, the fiber optic cable replaces the coaxial trunk and terminates the optical nodes at the coaxial feeder, thereby eliminating the coaxial cable trunk. Existing coax feeder plant is replaced with new coaxial cable and amplifiers capable of delivering a greater bandwidth. As rebuilds push fiber deeper into the feeder plant, the node size (homes served from an optical node) is reduced and the number of homes passed by fiber increases.

With experience, fiber-based architectures are gradually developing a look of their own. This evolutionary process began in 1988 when fiber proved into the cable plant in "supertrunk" overlays connecting multiple headends. *See* Figure 2. Savings were realized through headend consolidation, amplifier reduction, greater reliability, and increased performance. Within a few years, "backbone" applications were the mainstay of fiber deployment. *See* Figure 3. This involved replacing or duplicating the coaxial trunk with fiber. Today, the cable industry is looking for ways to deploy fiber even closer to the subscriber without incurring significant incremental costs over coaxial cable costs.

Figure 2. First Generation Fiber Supertrunk Architecture.



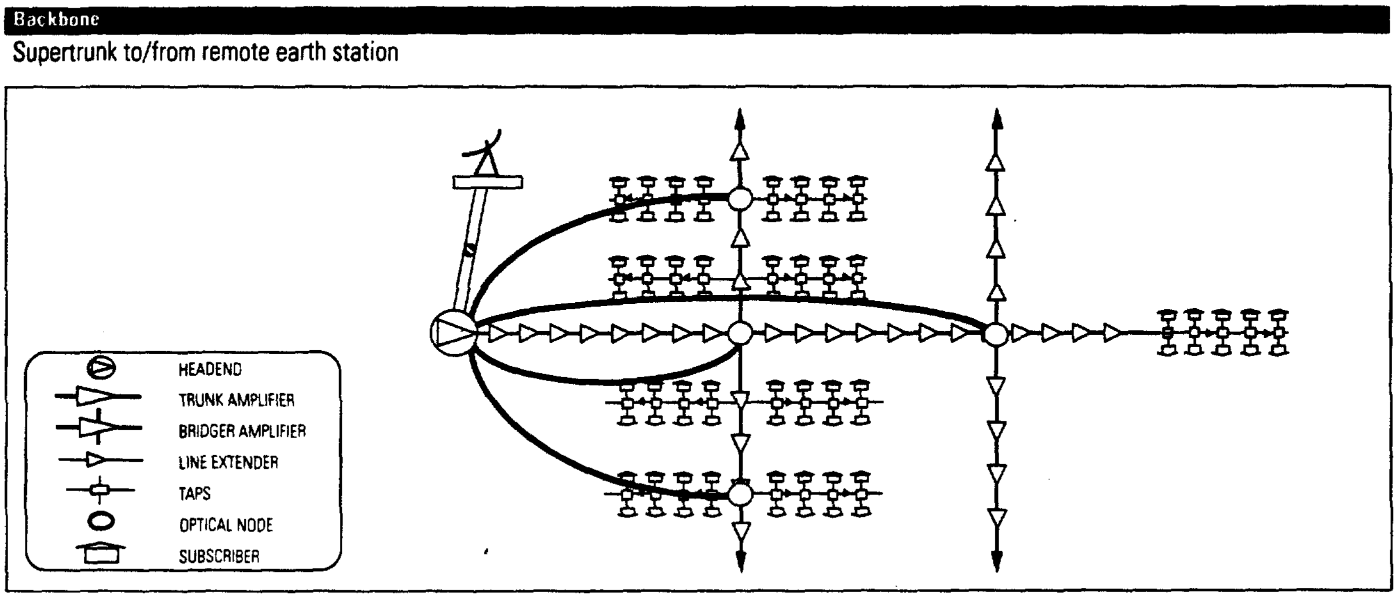

In the last year, as fiber deployment has accelerated markedly, the cable industry has found ways to use fiber to set the stage for future growth, while staying within near-term cost constraints. By far the most prevalent fiber architecture favored by the industry for this purpose is fiber-to-the-feeder (FTF).

The FTF architecture -- which also goes by other names depending on the MSO -- represents a shift away from the tree-branch to the star/bus configuration. *See* Figure 4. With FTF, multiple fiber trunks originate at a

## Figure 3. Fiber Backbone Architecture.

**Backbone**

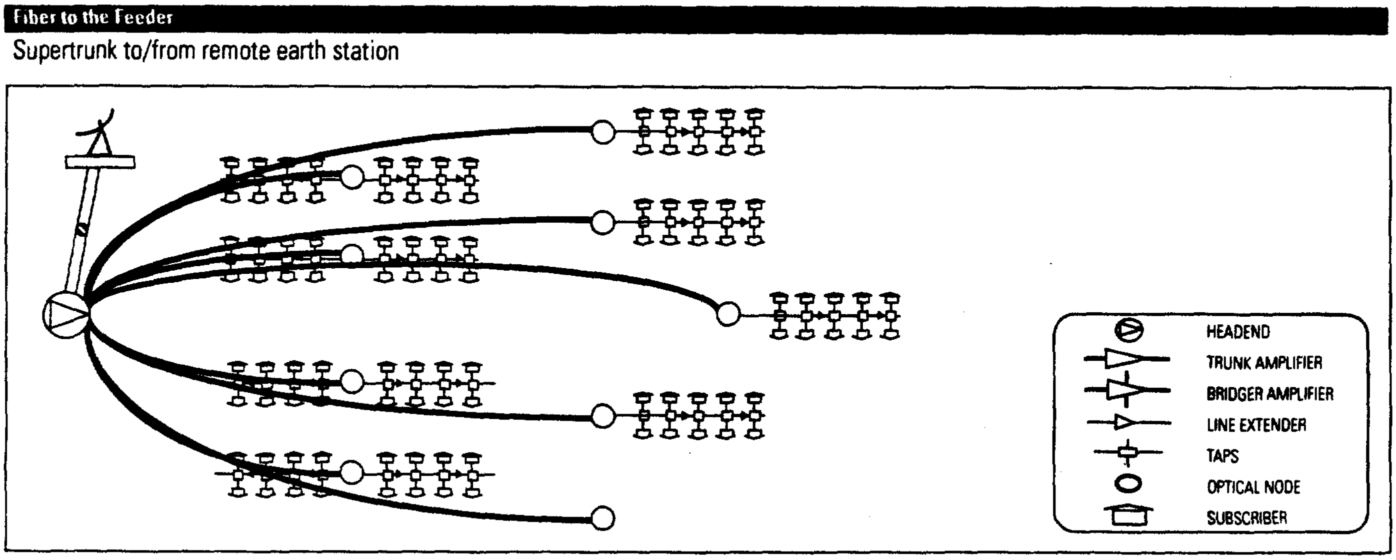
First generation of fiber deployment. Fiber is overlaid on existing coaxial plant to reduce RF amplifier cascades. Fiber extends from headend to optical nodes spaced every nth amplifier.




## Figure 4. Fiber to the Feeder Architecture.

**Fiber to the Feeder**

Next generation of fiber deployment. Fiber trunk replaces coaxial trunk to the existing coaxial feeder plant. FTF reduces RF amplifier cascades to no more than six amplifiers between the optical node and the subscriber.



headend and terminate at optical nodes, creating a star configuration. Each node, in turn, defines the serving area of, what is in essence, a "mini-cable system" where 500 to 5000 subscribers share the bandwidth over the coaxial "bus" portion of the distribution network. This is an effective low cost method of bringing fiber closer to the subscriber, thereby resulting in higher channel capacity and improved signal quality and facilitating the delivery of future interactive services.

*Today's fiber deployments can be easily upgraded to provide interactive broadband switched network service.*

Cable television's fiber/coax hybrid architectures can be fully upgraded to provide interactive broadband switched networks using technology that is available today. This can be done incrementally through evolutionary adoption of technologies and incremental investment. The first step is simply the installation of a fiber-rich cable television network.

TIA discusses below three alternative models for the upgrade of cable television plant. TIA does not advocate one model over the other but has chosen them solely as illustrative examples. For a brief summary of other demonstration systems, see Appendix A.

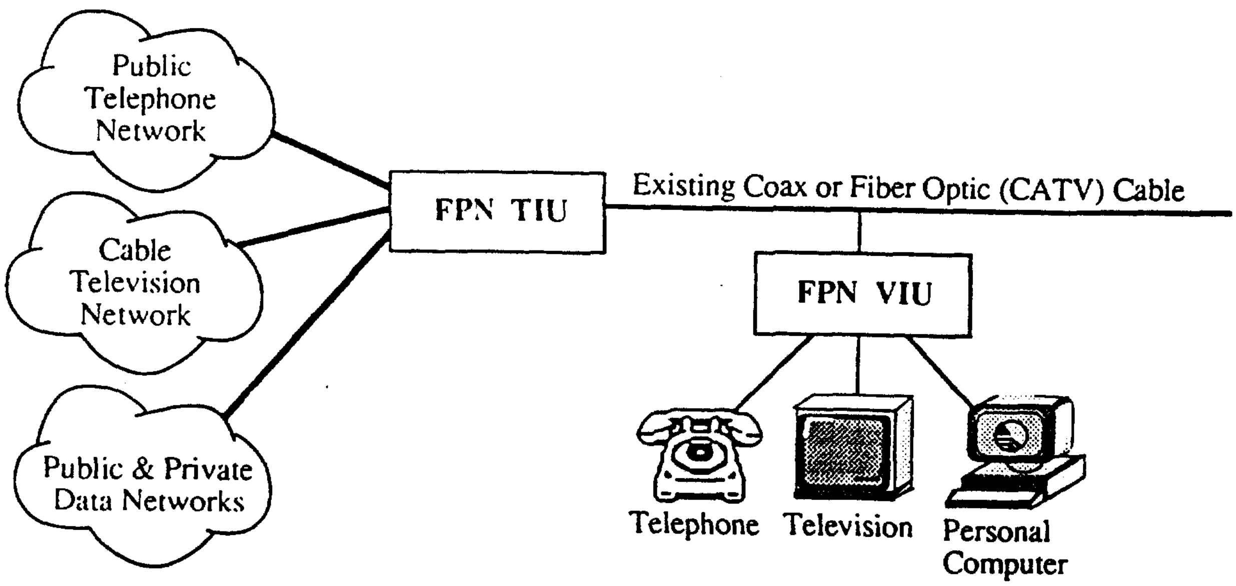
One model for upgrading cable plant is that of First Pacific Network (FPN). The services provided by this model include two-way voice, video, and data communications provided simultaneously over a single wire using standard telephone, television, and computer connections.

The FPN model requires a FTF architecture with optical nodes serving a maximum of 5000 homes. A Voice Interface Unit (VIU) installed in the home or business plugs into existing coaxial cable on one side and has standard telephone, television, and computer plugs on the opposite side. On the network side, a

Trunk Interface Unit (TIU) connects with existing public and private networks. Each subscriber must have a VIU but a TIU can serve up to 5000 subscribers. No other special equipment is required and the system can work with current coaxial drops or with fiber in the future. A simplified view of the FPN network is shown at Figure 5.

According to FPN, the estimated investment cost is $750 per home for a voice/video switching system.

Figure 5: FPN Network.




Source: First Pacific Networks.

Cox Cable TV has developed its own model for determining when to deploy fiber. This model demonstrates the trade-off between the investment required to bring fiber closer to the home and the increase in revenues to pay back the investment. According to the model, cable companies will only bring fiber as close to the home as the revenue potential allows.

From subscriber surveys, Cox has determined that subscribers are most concerned with system reliability and signal quality. Both factors can be enhanced with greater use of fiber. The further fiber is from the home the greater the number of coax amplifiers required between the optical node and the subscriber. This extra equipment decreases a system's reliability and signal quality by comparison with fiber.

According to Cox, by reducing amplifier cascades from 20 to 4, the incremental cost to the subscriber can easily be defended by improvements in reliability and signal quality. Further amplifier reductions, however, from 4 to 1, do not improve picture quality or reliability enough to justify the higher price increases for the subscriber. Understandably, cable companies must be able to recoup their incremental investment from new services such as pay per view or personal communications networks.

The third upgrade model is the Time-Warner model which is being implemented through its trial system in the New York City borough of Queens. Through evolutionary advances, this model will upgrade today's tree-branch architecture for broadcast video to a two-way switched broadband network for integrated voice, data, and video service.

The Time-Warner model demonstrates how investment can be made incrementally and balanced against revenue increases. The evolutionary path leverages cable's extensive investment in coaxial pipeline. According to Time-Warner, once a 550 MHz fiber-based system is installed, it can be upgraded to 1 Ghz bandwidth that will support advanced telecommunication services for an incremental cost of $50 per subscriber. This requires an additional $1.50 per subscriber in monthly revenues over the estimated life of the plant in order to break even. Such revenue could be collected in any combination of increased rates or revenue from new services.

The evolutionary stages are demonstrated in the following chart:

| Stage | Service | Upgrade Cost |
|---|---|---|
| Coaxial CATV | 300 mhz broadcast video PPV | Installed |
| Fiber Deployment w/ Electronics to Upgrade to 550 MHz | Increased PPV<br>Videotext<br>Scheduled Infomercials | $200/sub |
| Fiber Deployment w/ Electronics to Upgrade to 1 GHz | Personal Network Services<br>Long Distance Access<br>PCS | + $50/sub |
| Digital Compression<br><br>(requires 1 GHz*) | Near VOD<br>Interactive Information, Shopping, Education& Entertainment<br>Local Telephone Service<br>Financial, Household, and Professional Services | + $250/sub |
| Video Switching<br>(requires 1 GHz*) | Full motion Video<br>Point to Point (2-way Multimedia Interactivity | + $150-250/sub |
| Mass Digital Storage | Video on Demand<br>Enhanced Local Phone Service | +$100-150/sub |

* It is possible to provide these same services on less bandwidth (i.e., 550 mhz or less) but requires trade-offs in capacity for other services including broadcast video

Source: Time Warner

## III. Rate re-regulation and optical fiber deployment

Early in the Notice (¶4), the Commission asks what it considers a "basic question:" Did Congress intend that implementing rules result in lowering 1992 rate levels, or simply holding in check future rate increases? TIA respectfully suggests this is too limiting an inquiry. Rather than looking at cable prices from a narrow result orientation of rollback or slowdown, regulatory policy should look to justification in the public interest. Egregious and unwarranted past rates would be reduced under such a policy; yet even larger future rate increases could be accommodated if consumer welfare were sufficiently increased.

The legislative history does not reflect a legislative wish to stop the cable industry's remarkable growth. For example, the House Report on amendments to S.12 states:

> The Committee finds that since rate deregulation took effect in December 1986, the cable industry, as the Committee hoped, has invested substantially in capital improvements and programming . . . Similarly, the typical cable system offers 30 to 53 channels today compared to the typical 24 channels or less before the [1984] Cable Act was enacted.[7]

Despite Congress' findings that new legislation was needed to control some of the rate increases and other excesses of that period, the 1992 Act's statement of policy makes the cable industry's continuing expansion a matter at least of encouragement if not requirement:

> (3) ensure that cable operators continue to expand, where *economically justified,* their capacity and the programs offered over their cable systems; . . .[8]

Moreover, the Senate Report took pains to observe that while a cable franchising authority may not base its renewal decision on a system's "mix and quality of cable services," the franchisor may consider "whether a cable operator's channel capacity has been reasonable in light of community needs."[9]

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[7] H.R.Rep.102-628, 102d Cong., 2d Sess., 31.

[8] Section 2(b), 1992 Act, 47 U.S.C.§521, emphasis added.

[9] S. Rep. 102-92, 102d Cong., 1st Sess., 47. This is in line with the 1984 Cable Act's general allocation to franchising authorities of the power to provide for adequate facilities and equipment to meet local requirements. 47 U.S.C.§544.

*TIA supports the Commission's view*
*on the potential need for*
*cost-of-service rate justifications.*

The Notice explains the constraints of non-existent or non-uniform cost data, as well as scarcity of regulatory resources and the statutory preference for simplicity, in tentatively choosing "benchmarking" methodologies over cost-of-service standards as guidelines for regulation of basic service and cable programming service rates. However, cost-of-service measures

> could nonetheless have a place in our regulatory framework for cable operators seeking to justify rates higher than would be considered reasonable under the benchmark standard we could adopt to regulate cable rates. (¶40)

In its representation of manufacturers of optical fiber and components, TIA has a particular interest in sustaining and accelerating the cable industry's increasing use of this medium to expand channel capacity and improve system performance -- for example, through reduced need for coaxial amplifiers.[10] TIA recognizes that the FCC cannot make itself an arbiter of preferred technologies. It can, however, make clear to cities, states and cable operators that federal rate guidelines are meant to permit recovery of the costs of capacity upgrades, whether achieved effectively through signal compression over coax, through fiber overlays or rebuilds, or even by innovative uses of radio.

For the most part, rebuilding and upgrading of cable systems will be a matter of consensus between cable operators and local franchising authorities, who are given principal responsibility by law for the equipment and facilities used to deliver cable service. Since these authorities also will be the first line of <u>basic service</u> rate regulation, there should be a match between the franchisor's

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[10] See discussion at Section II, pages 4-11.

determination of community need for improved facilities and the approval of rates that will allow the added expense to be recovered.

Where cable programming service rates are concerned, the FCC supplants the franchisor as the judge of unreasonableness of charges, through complaints which may be brought by subscribers or even by the local authority. 47 U.S.C. §543(c). Among the factors the Commission "shall consider" are the "capital and operating costs of the cable system . . ."

In this role, TIA does not believe Congress intended the federal agency to second-guess agreements between cable operators and franchisors to deploy technologically advanced facilities. And the franchisor, once having agreed to such an advanced deployment, should be restricted in its ability to complain of cable programming service rates designed to recover the prudent costs of the deployment.

*The cable operator's continued ability to invest in advanced network deployment is a matter of national as well as local interest.*

As the Commission has noted in an earlier proceeding, the public interest is served by

> increased investment opportunities for the development of an advanced telecommunications infrastructure, which will provide additional potential for expanded economic development in many communities . . .[11]

TIA strongly concurs with this view.

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[11] *Telephone Company-Cable Television Cross-Ownership Rules,* Second Report and Order, CC Docket 87-266, 7 FCC Rcd 5781, 5787 (1992).

While campaigning last year, President Bill Clinton on many occasions emphasized that an advanced telecommunications infrastructure is critical to the future growth of our nation's economy:

> In the new economy, infrastructure means information as well as transportation. More than half the U.S. workforce is employed in information-intensive industries, yet we have no national strategy to create a national information network. Just as the interstate highway system in the 1950s spurred two decades of economic growth, we need a door-to-door fiber optics system by the year 2015 to link every home, every lab, every classroom, and every business in America.[12]

Numerous studies have confirmed the link between telecommunications infrastructure, particularly an interactive broadband network, and economic growth. This is driven by the impact such an infrastructure is likely to have on growth in productivity. As President Clinton said in September:

> If U.S. productivity had grown at the same rate in the 1970s and 1980s that it did in the 1950s and 1960s, the standard of living of the American family would be 40% higher.[13]

Clearly, productivity growth is the key to national prosperity.

The Economic Strategy Institute estimates that the accelerated deployment of a broadband network would increase productivity growth by one-fifth to two-fifths of a percentage point annually, generating an additional $194 billion to $321 billion of GNP growth by the year 2007. These gains would be realized through increased efficiency and improved quality of output in sectors that would make use of the technology.

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12 Remarks, Wharton School of Business, University of Pennsylvania, Philadelphia, Pennsylvania, April 16, 1992, page 7.

13 *Technology: The Engine of Economic Growth,* A National Technology Policy for America, September 21, 1992, page 3.

For example, Putnam Companies, a $42 billion investment management firm in Boston, uses interactive video links between 200 work stations to increase productivity by 20 to 40%. Steelcase, a metal furniture manufacturer, has reduced its training budget by one-third and increased the number of employees trained by a factor of five through multimedia interactive training tools.[14]

Our foreign competitors are very aware of these benefits and, consequently, are implementing aggressive plans to realize them. Japan has already issued development contracts for new generations of fiber, cable and mass splicing needed to wire the entire country with fiber optics by 2015.[15] Germany also is moving more aggressively. It plans to deploy fiber in the loop to 1.5 million homes in the former East Germany by 1995. Rather than deploy copper in new builds as the United States continues to do, the Germans want to leapfrog to fiber optics.[16]

If other nations deploy interactive broadband networks before the U.S., American companies will be at a competitive disadvantage in the global marketplace. The first nations to develop and deploy these transport systems will also be position to dominate future markets for the equipment and services associated with them. Traditionally, the development of software has followed that of hardware, and there is no reason to doubt the power of that pull today.[17]

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14 Robert B. Cohen, *The Economic Impact of Broadband Communications on the U.S. Economy and on Competitiveness*, Economic Strategy Institute, Washington, D.C., February 1992. The author placed this study on the record of CC Docket 87-266, the video dialtone proceeding.

15 Michael Galbraith, "Japan Thinks Big on the Fiber Front," *Telephony*, May 6, 1991, at 35.

16 John Blau, "Germans Mount Huge Fiber Upgrade Plan," *Comm Week International*, December 16, 1991.

17 *See, generally*, TIA's comments in the video dialtone proceeding, CC Docket 87-266, February 3, 1992, 21-25.

TIA believes that the interactive broadband infrastructure in the United States will come to consist of a "network of networks." This is evidenced by increased competition between and among network providers that traditionally have been segregated. Cable operators and competitive access providers ("CAPs") are moving into the voice and data markets of telephone companies. With video dialtone, telephone companies are inching toward new methods of video delivery. And satellite, cellular and microcellular alternatives to conventional wire and cable networks are proliferating. This network of networks was acknowledged by the FCC in its proceeding on expanded local exchange interconnection.[18]

As discussed above in Section II, the cable industry is rapidly deploying fiber in an effort to improve service and expand service offerings. Once seemingly desirous of protecting its uniqueness in video delivery, the cable industry lately has begun to move not only into voice and data services but also into multimedia and non-entertainment video services.[19] The cable industry is contributing signifantly to the development of our national interactive broadband network of networks. TIA strongly believes that this trend should be enhanced by rate regulation policies encouraging continued investment in advanced technologies such as fiber optics, through new builds, rebuilds and upgrades.

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[18] Expanded Interconnection with Local Telephone Company Facilities, CC Docket 91-141, FCC 92-441, *Second Notice of Proposed Rulemaking*, ¶4.

[19] For example, a distance learning network collaboration between Rochester Telephone and a cable system is described in *Telecommunications Reports,* December 14, 1992, page 17. *See also,* "Time Warner Plans 2-Way Cable System," *Washington Post,* January 27, 1993, page F1.

*Cost-of-service principles should not be applied as if cable operators were common carriers.*

The House Report, concerned that legislative terms in Section 3 of the 1992 Act "are similar to those used in the regulation of telephone common carriers," delivered the following qualification:

> It is not the Committee's intent to replicate Title II regulation. . . .The Committee does not intend for the Commission, in determining the reasonable profit allowed cable operators, to create a traditional "rate of return" comparable to that permitted telephone common carriers. The Commission should recognize that the basic service tier constitutes only a portion of the cable operator's overall business; that an operator's revenues from other cable services can contribute to, offset, or constitute a "reasonable profit;" . . .[20]

When this language is combined with admonitions to "keep the rates for basic cable service low,"[21] it seems fair to infer that cable programming service rates should not necessarily be found unreasonable because they are higher per channel or contribute more to earnings than basic rates -- even after adjustment for variable programming costs.

If the FCC follows the conferees' broad hint that "joint and common costs allocated to the basic service tier should be less than the amount that would be allocated on a 'per channel' basis,"[22] there must be flexibility for the cable operator to make up, in prices for cable programming services, the overallocation of costs to other tiers. The flexibility may consist of (1) tolerant

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[20] Note 4, *supra,* at 83.

[21] H.R.Rep.102-862 ("Conference Report"), 102d Cong.,2d sess., 63.

[22] *Id.* The conferees also warned that "the regulated basic tier must not be permitted to serve as the base that allows for marginal pricing of unregulated services."

benchmarking of cable programming service rates and/or (2) the allowance of cable programming service revenues that exceed properly attributable direct and indirect costs plus average profit.

TIA thus does not believe, in response to the Notice's question at ¶94, that regulations could or should be designed too produce low rates for both the basic service tier and cable programming services. Such excessive regulation would stifle the cable industry's ability to invest in new technologies, especially fiber optics, and is contrary to the public interest, given the role cable is playing in the deployment of our national interactive broadband network of networks. Furthermore, over-regulation of both the basic and cable programming tiers would defeat Congress' desire, under the leased access provisions of the 1992 Act, that lessees have a "genuine outlet" for their new product. For cable operators likely would feel pressed to earn disproportionately on such rentals. (Notice, ¶156, citing Senate Report)

*Benchmarks should be designed to accommodate cable's deployment of advanced broadband networks.*

For the reasons discussed above, the Commission's regulation of cable basic and programming service rates should not only accommodate but encourage the deployment of advanced networks by the cable industry. Allowing cable operators to justify extraordinary costs of new builds, rebuilds and upgrades is part of the answer. So too is the recognition that reasonable cable programming service rates may have to contribute relatively more in revenues and earnings if a regulatory authority determines to keep basic tier prices low.

But both of these principles are keyed to the varying circumstances of individual systems. Applying cost-based regulation and making judgments about the reasonableness of cable programming service rates is likely to be, at least initially, a time-consuming and uncertain process. This is where benchmarking, to measure the individual system against an ideal or a type, may provide a useful tradeoff for specific adjudication. What is lost in accuracy of measurement of an individual system's costs and revenues may be saved in time and litigation expense.

Advanced Technology Cost-of-Service. Of the benchmarks discussed in the Notice, TIA believes a cost-of-service standard derived from cable's growing experience with advanced technology deployment would be the best. Eventually, the real-world application of such model networks as those discussed in Part II, and the commercialization of trials such as those discussed in Appendix A, will produce data from which typical and prudent costs of advanced interactive broadband deployment can be measured. It will then be possible to create a range, within which the operator's capital expense would be presumed reasonable and recoverable in rates.

Throughout this proceeding, TIA will work to supply information on development of an "advanced technology cost-of-service" benchmark, with emphasis on optical fiber and components. Cable operator responses to the FCC questionnaires issued in this docket may assist the process. Even if the statutory deadline of April 1993 is too close for such a benchmark to be devised before issuance of FCC guidelines, the agency can and should continue to work toward a standard of this kind -- in the present docket or some other proceeding opened for the purpose.

The other benchmark alternatives discussed in the Notice are to varying degrees biased against or not designed to accommodate the deployment of advanced technology in the cable industry, particularly fiber optics. These are discussed in more detail below.

Effective Competition. Almost by definition, cable systems which are deemed subject to effective competition because of low penetration -- 30% or less